

# DELAWARE GK-12: A PARTNERSHIP FOR IMPROVING SCIENCE EDUCATION IN VO-TECH HIGH SCHOOLS

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## Project Description

The University of Delaware and the New Castle County Vocational Technical School District have initiated a GK-12 partnership in which nine UD graduate students in the sciences are selected annually to serve as Fellows. Fellows have been paired with high school science teachers, and these pairs, along with the Pls of this program, have formed a learning community focused on examining and reflecting on current issues in science education while specifically addressing critical needs in teaching science in vocational technical high schools. During summer workshops and in follow-up meetings facilitated by the Pls, the Fellows have been introduced to innovative teaching strategies including problem-based learning and coteaching. Fellow/teacher pairs are developing activities and assessments that are in alignment with state science standards and that support student learning through inquiry. In this GK-12 project, Fellows have enhanced the science classroom experience for high school students while simultaneously gaining insight for themselves into current issues of science education. Fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational-technical high schools. Furthermore, Fellows have grown in their ability to communicate scientific understandings to an audience with multiple and diverse learning needs.

<http://www.udel.edu/GK-12/>

Fast Facts about NCCoVoTech District	
Number of Schools	3
Student Enrollment	3,386 (49% female; 99% minority)
% of Special Education Students	14.8%
Student to Computer Ratio	27 : 1
Average Daily Attendance	95.9% (State = 92.6%)
Graduation Rate	96.1% * (State = 83%)
Overall satisfaction rating (parent and student)	4.30 out of 5
% of parents who would recommend district	93%
Employer satisfaction with students	4.25 (out of 5)

### Career Areas at Howard High School

- Academy of Finance
- Carpentry
- Computer Network Administration
- Cosmetology
- Culinary Arts
- Dental Assistant
- Electrical Trades
- TSS
- Naval Technicians
- Public Service

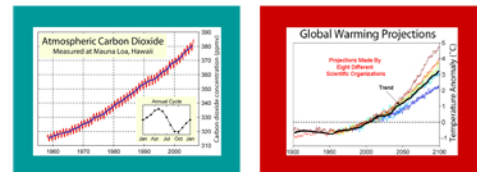
## Funding Agency - National Science Foundation, Division of Graduate Education Graduate Teaching Fellows in K-12 Education (GK-12)

### Project Highlights Lesson Study

Lesson study is a Japanese approach to instructional improvement. It is a cycle in which teachers work together:

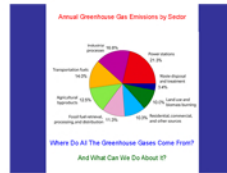
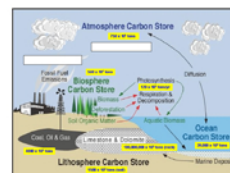
1. To consider their long-term goals for students,
2. Bring those goals to life in research lessons,
3. Conduct the lesson (with one team member teaching and others gathering evidence on student learning and development)
4. Collaboratively observe, discuss, and refine the lessons.
5. Teach the revised lesson in another classroom to study and improve it again.

**HOW TO SUCCEED**  
HOWARD HIGH SCHOOL OF TECHNOLOGY



**Participants: Katie Skalak, Richard Donham, Ralph May, Carol Buswell, Tami Lunsford, Fran Smart**

Group developed, taught, observed, and analyzed a research lesson on Global Climate Change and Alternative Energy Sources and Fuels. The lesson was conducted over a period of three days in block scheduling. One member of the group taught the lesson while other group members observed student learning and made detailed records of their observations. Lessons were also videotaped for future analysis.



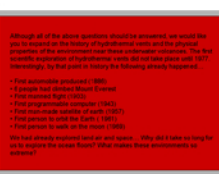
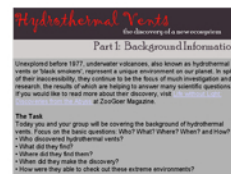
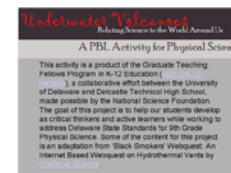
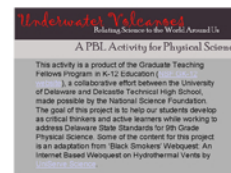
The group is now focusing on developing quantitative reasoning skills and has partnered with the Math department. The goals for the lesson study group for the upcoming semester are:

1. Increase classroom research and reflective practice.
2. Develop a body of peer-reviewed lesson which can be shared.
3. Continue to work collaboratively.
4. Increase communication between Math and Science.
5. Increase student understanding of quantitative reasoning skills (i.e. graphical interpretation, equation manipulation).

### Project Highlights Incorporating Research

A teacher/fellow pair at Delcastle has developed a web-based semester long activity which integrates the fellow's research into the Physical Science curriculum while addressing the Delaware State Standards. Students will:

1. Conduct their own research on an aspect of hydrothermal vents.
2. Communicate with their research group through a web page that they create to upload images and research.
3. Integrate their research into a poster.
4. Evaluate posters in a poster presentation session at the end of the semester.

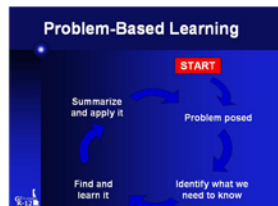


**Delaware GK-12 Activities**

- In summer workshops, teaching teams will be introduced to a number of innovative teaching strategies, including problem-based learning (PBL).
- During the academic year, Fellows will engage in coteaching with their teacher partners.
- Fellows will gain a better understanding and appreciation of the complexities and nuances of teaching science in high school.
- Teaching teams will have the opportunity to develop PBL activities, aligned with curricular needs, for students to experience the benefits of guided inquiry learning environments.

**What is Coteaching?**

- Teaching at the elbow of the other, with multiple teachers
- Focus on learning of ALL students
- Supportive environment for analyzing and critiquing practice
- Opportunity to learn aspects of teaching that are not easily verbalized
- Link between theory and practice



**We Will Use PBL to:**

- Motivate learning by connecting science course content to real world situations
- Assess content understanding to inform future instruction
- Foster development of reasoning, communication, information retrieval, and team-building skills

**Delaware GK-12 Benefits**

- Expected outcomes include:
  - Improved communication, teaching, and team building skills for the Fellows,
  - Professional development opportunities for science teachers,
  - Enriched learning for the high school students, and
  - Strengthened partnership between University of Delaware and the New Castle County VoTech School District.

## Project Evaluation

The planned evaluation includes external and internal activities. The Evaluation and Assessment Center for Mathematics and Science Education (E & A Center) in Ohio will serve as the external evaluator for the proposed project. The Center brings together the strengths of three evaluation groups: the Evaluation Services Center (Dr. Deborah Zorn, Director) at the University of Cincinnati, the Applied Research Center (Dr. Robert Seufert, Director) at Miami University—Middletown, and the Evaluation and Assessment Center (Dr. Jane Butler Kahle, Principal Investigator) at Miami University-Oxford. The Center is the repository of valid and reliable instruments to assess progress in the various science disciplines. It is noted for its effective dissemination of research findings through both scholarly and popular venues.

Based on the goals of the project, the evaluation will be guided by the following questions:

1. Do the project activities deepen and extend science content knowledge for fellows, teachers, and high school students?
2. Do the project activities deepen and extend pedagogical knowledge for fellows and teachers?
3. Do the project activities create learning communities?
4. What elements of the program become institutionalized as a program partnering STEM graduate students and teachers to address critical issues in high school science education?

Multiple sources of quantitative and qualitative data will be gathered from fellows, faculty research advisors, cooperating teachers, and high school students. In addition, artifacts, including PBL and Lesson Study units, will be collected and used to address the evaluation questions. The external evaluation will also review reports conducted as part of internal evaluation activities.